PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in or relating to Air Heaters.

I, GEORGES MARIE GÉROUILLE DE BEAUVAIS, a citizen of the French Republic, of 181, rue de la Pompe, Paris, in the Republic of France, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Various heat exchangers of the plate type are already known. In these exchangers the connection between the successive plates is known to be obtained by shaping the edges of these plates, by bending them over on to each other or on to U-shaped connecting members. The result is a serious complication in the manufacture of the article since it is necessary after having stamped these sheets out, to shape their edges in a complex manner.

The present invention relates to an air heater the construction of which is improved so as to overcome the former disadvantages.

This air heater is characterised by the combination of flat plates, spacing members interposed between the plates and holding them a suitable distance away from each other and fixing members, preferably of U shape, fitted over the adjacent flat edges of these plates and of the spacing members, these fixing members producing, preferably elastically, the desired clamping between the said edges, so as to ensure their assemblage.

An air heater can thus be constructed by the aid of flat plates and spacing members such as U irons or channel irons commonly used in constructional work. This heater having only elements which are easy to manufacture and of low cost price is itself easy and economical to make.

The invention will be readily understood from the following description with reference to the accompanying drawings illustrating by way of example several ways of carrying the invention into effect.

Figure 1 of the drawings shows, in section, an assembling member of the air heater in accordance with the invention and comprises a plate and a U-iron forming a cell in the construction of an air heater of the plate type.

Figure 2 is a perspective view of two of these cells for the circulation in one of them of the gases of combustion and, in the other one in a perpendicular direction of the heating air, these cells being ready to receive their assembling or fixing members.

Figure 3 is a perspective view of a series of these cells connected together.

Figures 4, 5 and 6 show, respectively in elevation (part broken away), in section on line 5—5, of Figure 4, and in section on line 6—6 of Figure 4, two cells contiguous to each other in which the circulation of the air and of the gases of combustion may be effected in a special manner, other than in two directions at right angles; the fixing members are not shown in these three figures.

In the following description with reference to the drawings, it has been assumed that the air heater is for the purpose of heating air by means of gases of combustion although it has of course other applications.

Referring to Figures 1 to 6 of the drawing to one face and at opposite edges of a rectangular plate *a* of suitable dimensions there are applied two U-irons *b* of the length of these edges, by one of their parallel portions, their bottom portions being turned towards each other. Each of the said edges is fixed to the portion of the U-iron *b* applied thereto by means of a member *c* of U-shaped cross section and of such a nature as to straddle across these two parts over their whole length and to press the said two parts together,

[Price 1/-]

preferably and keeps them pressed, by reason of elasticity of the parallel portions of this member *c*.

A number of plates *a* with U-irons fixed thereto as above described, which plates if they are square have U-irons of equal length, and if they are rectangular other than square some having U-irons along the shorter edges and some U-irons on the longer edges are so assembled together that the U-irons of a plate are in contact with the free surface of an adjacent plate and with the edges of this plate which do not carry U-irons. Then the free portion of each of the U-irons is fixed to the edge of the adjacent plate, by means of a member *c* of U-shaped as described above.

In this way a group is obtained of which one of the extreme plates carries U-irons projecting upon its outer face. There is fixed to the free portions of these U-irons, projecting as described, a plate *a* of the same dimensions as those comprised by the said group, but not provided with U-irons, the plate being preferably relatively thick as is moreover the other extreme plate of the group. The group is thus of parallelipipedic form and comprises successive cells open at their extremities, arranged alternately in one direction and in another direction at right angles and the external faces of the end plates of which are free.

The circulation of the fluids the temperatures of which it is desired to exchange can be effected in another manner than that mentioned above, for example that shown by Figures 4 and 6, where it will be seen that one cell in two is formed by two plates *a* separated by a frame constituted itself by U-irons *b* and one of the sides of which is formed of a U-iron b^1 leaving, between its ends and those of the U-irons *b* which are perpendicular to it, suitable intervals, while U-iron b^1 carries on its inner face, a baffle *d*. Hence the entry into each cell thus constituted is effected by means of one of said intervals while the other of said intervals constitutes the exit, the fluid in its course from entry to exit having passed round the baffle, which compels the said fluid to have a more prolonged contact with the heat transmission surface. The other fluid passes into the other cells between the corresponding U-irons *b*.

In order to terminate the apparatus two of the opposite ends of the parallelipiped block obtained, towards which some of the cells open, are suitably fixed to strong frames, (not shown) of such a nature that it may be possible to employ a single block or if it be desired to obtain a heat exchanger of greater effect, to group several of these blocks by connecting between them their corresponding frames, by means of bolts for example. It is understood that all precautions will be taken by using suitable means such for example as irons in the shape of a comb, so as to prevent the displacement of the U-irons *b* in case certain members *c*, badly placed or loosened, should no longer retain the said irons and so as to prevent, when the fluids circulate in their respective cells, any communication between these fluids by the interior of the U-irons *b* opening into the frames.

In this way a group is obtained which can serve as a heat exchanger between the gases coming from a flue and the air which it is proposed to heat. To this end the exchanger is made to rest by one of its frames upon the flue. The hot gases pass by the cells opening into this flue and escape by the chimney whilst the air to be heated, carried along by any suitable means such as a fan for instance, passes into the other cells which have been made to open at their ends at one side into the open air and, at their other ends, into the framework abutting upon the fan.

As will be readily understood, the invention is by no means restricted to the particular details of construction and application hereinbefore described and which may be varied within the scope of the appended claims.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An air heater of the plate type, characterised by the combination of flat plates, spacing members interposed between these plates and holding them at a suitable distance from each other, and fixing members fitted over the flat adjacent edges of the plates and of the spacing members, said fixing members exerting, preferably elastically, the desired clamping between the said edges, so as to ensure their assembly without the aid of any locking or soldering.

2. An air heater substantially as described with reference to the accompanying drawings.

Dated this 12th day of June, 1924.

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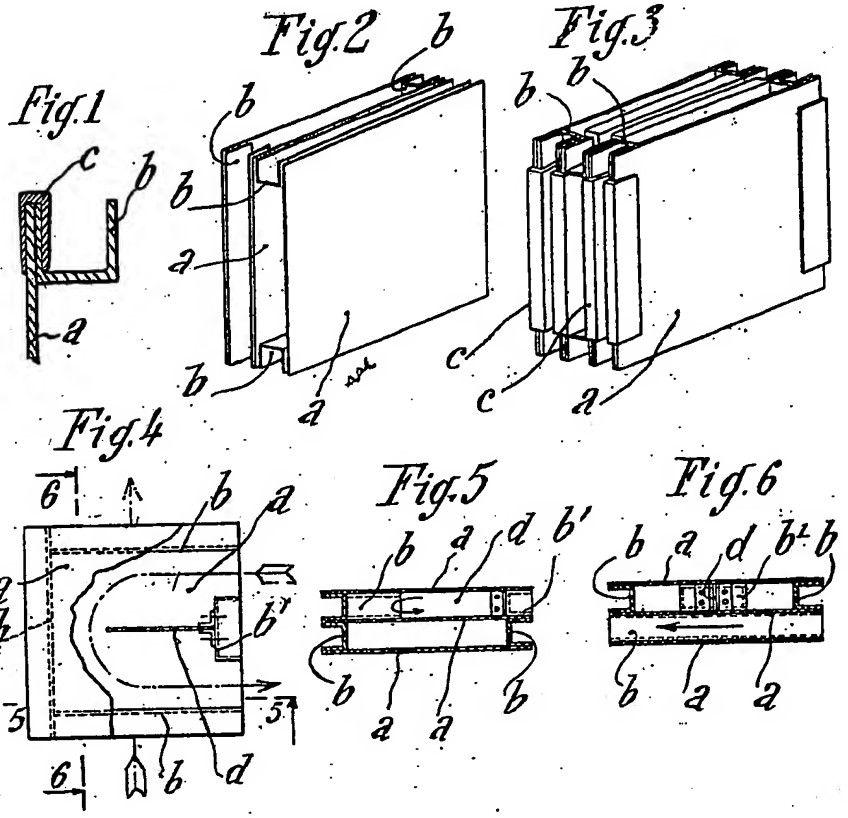
Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1925.



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